

WHAT IS CLAIMED IS:

- 1                   1.     A method for indirectly estimating ambient air temperature,  
2     the method being for use with a vehicle having an engine and a turbocharger, the  
3     method comprising:  
4                   sensing a first turbocharger air inlet temperature;  
5                   indirectly estimating a first ambient air temperature by filtering the  
6     first turbocharger air intake temperature to compensate for engine compartment  
7     temperature variations relative to actual ambient air temperature; and  
8                   controlling the vehicle based on the estimated first ambient air  
9     temperature.
- 1                   2.     The method of claim 1 wherein the filtering comprises  
2     compensating for a vehicle operation which causes the engine compartment  
3     temperature variations relative to actual ambient air temperature.
- 1                   3.     The method of claim 2 wherein the filtering comprises adding  
2     a temperature filtering value to the first turbocharger air inlet temperature.
- 1                   4.     The method of claim 3 wherein the temperature filtering value  
2     is based on engine speed to compensate for engine compartment temperature  
3     variations due to driving the vehicle.
- 1                   5.     The method of claim 4 wherein the temperature filtering value  
2     is further based a fan usage time to compensate for engine compartment temperature  
3     variations due to fan operation.
- 1                   6.     The method of claim 1 further comprising updating the first  
2     filtered ambient air temperature estimate based on a temperature difference between  
3     the first filtered ambient air temperature estimate and a second filtered ambient air  
4     temperature estimate.

1                   7.       The method of claim 6 wherein the updating comprises adding  
2 a temperature update value to the first filtered ambient air temperature estimate.

1                   8.       The method of claim 7 the temperature update value limits  
2 increases to the first filtered ambient air temperature estimate if the second filtered  
3 ambient air temperature estimate is greater than the first filtered ambient air  
4 temperature estimate to limit unnatural increases in estimating ambient air  
5 temperature.

1                   9.       The method of claim 8 wherein the temperature increase is  
2 limited to a maximum percentage increase per wait time, the wait time  
3 corresponding to a period of time between sensing the first and the second  
4 turbocharger air inlet temperature.

1                   10.      The method of claim 6 further comprising storing the updated  
2 ambient air temperature estimate as a frozen ambient air temperature estimate if an  
3 engine load is greater than an engine load limit to compensate for engine  
4 compartment temperature variations due to the engine operating above the engine  
5 load limit.

1                   11.      The method of claim 10 further comprising storing the frozen  
2 ambient air temperature estimate only if the engine load is greater than the engine  
3 load limit for a period of time longer than a load limit interval.

1                   12.      The method of claim 11 further comprising storing a sensed  
2 barometric pressure occurring proximate in time to storing the frozen ambient air  
3 temperature estimate for use in adjusting the frozen ambient air temperature estimate  
4 according to changes in barometric pressure.

1                   13.      The method of claim 12 further comprising calculating a  
2 change in sensed barometric pressure, updating the frozen ambient air temperature  
3 estimate as a function of the change in sensed barometric pressure.

1                   14.    The method of claim 13 wherein updating the frozen ambient  
2   air temperature comprises increasing the frozen ambient air temperature estimate if  
3   the barometric pressure increases and decreasing the frozen ambient air temperature  
4   estimate if the barometric pressure decreases.

1                   15.    A system for controlling an engine by indirectly estimating  
2   ambient air temperature, the system comprising:  
3                   means for determining a turbocharger air inlet temperature; and  
4   means for estimating ambient air temperature based on data received from the  
5   turbocharger air inlet temperature;  
6                   means for filtering the estimate ambient air temperature to  
7   compensate for engine compartment temperature variations causing the turbocharger  
8   air inlet temperature to inaccurately represent actual ambient air temperature; and  
9                   means for controlling engine operation based on the filtered ambient  
10   air temperature estimate.

1                   16.    A system for controlling an engine by indirectly estimating  
2   ambient air temperature, the system comprising:  
3                   a sensor for sensing a turbocharger air inlet temperature; and  
4                   an engine control module configured for:  
5                   estimating ambient air temperature based on the turbocharger  
6   air inlet temperature,  
7                   filtering the estimate ambient air temperature to compensate  
8   for engine compartment temperature variations causing the turbocharger air inlet  
9   temperature to inaccurately represent actual ambient air temperature; and  
10                  controlling engine operation base on the filtered ambient air  
11   temperature estimate.

1                   17.    The system of claim 16 wherein filtering comprises adding a  
2   temperature filtering value to the first turbocharger air inlet temperature, the  
3   filtering value based on both an engine speed to compensate for engine compartment  
4   temperature variations due to driving the vehicle and a fan run time to compensate  
5   for engine compartment temperature variations due to fan operation.

1                    18.     The system of claim 16 further comprising storing the filtered  
2     ambient air temperature estimate as a frozen ambient air temperature estimate if an  
3     engine load is greater than an engine load limit to compensate for engine  
4     compartment temperature variations due to the engine operating above the engine  
5     load limit.

1                    19.     The system of claim 18 wherein the frozen ambient air  
2     temperature estimate is updated based on a change sensed barometric pressure.

1                    20.     The method of claim 19 wherein the frozen ambient air  
2     temperature is increased if the barometric pressure increases and decreased if the  
3     barometric pressure decreases.